

Aero-Space Technology Enterprise Performance Targets and Indicators

Target 1R1: Complete 75% of the conceptual designs of systems for preventing and mitigating accidents (programmatic performance indicators are listed below), and to demonstrate tools for accident analysis and risk assessment.

Aero-Space Focused — Aviation Safety

- Conceptual designs of safety-improvement systems is completed for all projects
- Operational test of risk assessment aid: Demonstrate, in operational environment, tools for merging heterogeneous databases to aid causal analysis and risk assessment.
- Proficiency Standards: Identify flight crew knowledge and proficiency standards for automation.
- Integrated onboard health management system design: Define architecture for integrated onboard health management system.
- Concepts to limit fires: Develop proof-of-concept of technology to limit fuel flammability.
- Design criteria for low false alarm: Establish design criteria for reliable, low false-alarm fire detection systems.
- Synthetic vision retrofit concepts: Selection synthetic vision concepts suitable for retrofit in commercial, business, and GA aircraft.

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- Demonstrate Intelligent Life Extending Control (ILEC) for a commercial aircraft engine through hardware in the loop simulation using component damage modeling.
- Combine Propulsion Controlled Aircraft (PCA) control laws with the Intelligent Flight Control System (IFCS) to demonstrate a new capability for adapting to absence or loss of any and all control surfaces resulting from failures or malfunctions up to and including propulsion only flight.
- Provide alloys for engine blades and disks which are more crack resistant.
- Flight validate advanced control laws and modes for reduced pilot workload and increased safety in low visibility using integrated design tool Control Designer's Unified Interfaces (CONDUIT).
- Complete report on Phase I testing of tire dynamics mechanical properties.
- Identify and evaluate existing crew strategies for reducing errors in the management concurrent tasks
- Downselect of ground-based remote sensor technologies for a prototype ground-based system to sense icing conditions.
- Issue an ultra-safe gear design guide for rotorcraft
- Demonstration of strong correlation of analytic model predictions of rotorcraft crashworthiness with full-scale water/soft-soil-impact test results
- Health and Usage Monitoring Systems (HUMS) Certification Protocols detailed for rotorcraft
- Submit documentation of certification methodology for rotorcraft composite structures analysis / certification
- Demonstration of “express-tool” technology linkage to design technologies that reduce design-to-fabrication time by 50 percent for sophisticated rotorcraft parts and assemblies

Target 1R2: Complete one system level technology benefit assessment, one component concept selection and one new material system.

Aero-Space Focused — Ultra-Efficient Engine Technology

- Select turbine flow control concept(s)
- Develop 1350°F turbomachinery disk alloy
- Define propulsion system concept(s)
- Complete selection of the most promising simulation approach for predicting propulsion-airframe integration effects for unconventional aircraft

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- Complete development of heavyweight (laboratory) energy storage (fuel) cell, electrolyze, control system.
- Investigate active control of high-frequency instabilities in combustion flows
- Demonstration of "smart" panel technology with a wind tunnel test of a smart UCAV with hingeless control surfaces.

Target 1R3: Complete large scale demonstration of a 2-5 decibel reduction in aircraft noise based on 1997 production technology, and initial assessments of concepts offering additional reduction

Aero-Space Focused — Quiet Aircraft Technology

- Airframe and engine noise reduction concepts that individually or collectively show analytical potential for at least 3 decibel further reduction in noise levels.

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- Full-scale static engine validation of fan and jet noise reduction concepts including active control of fan tones, and large-scale wind tunnel validation of airframe noise reduction concepts

Target 1R4: Complete the civil tiltrotor project by validating databases for contingency power, flight paths, and noise reduction, as well as complete at least one demonstration of an airspace management decision support tool.

Aero-Space Focused — Aviation Systems Capacity

- Comprehensive mission simulation database integrated cockpit and operating procedures for complex, low noise flight paths.
- Large scale database of noise reduction and validated design for noise capability.
- Develop and demonstrate transition airspace decision support tools for: (1) ATC/airline operations center and ATC/cockpit information exchange, and (2) conflict resolution.

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- Demonstrate a prototype data communications scheme for the National Airspace System.

Target 1R7: Complete the Advanced General Aviation Transport Experiments project by validating transportation system concepts through flight test and publish design guidelines; establish at least one partnership agreement on Small Aircraft Transportation System program.

Aero-Space Focused — Small Aircraft Transportation System (SATS)

- Partnership agreement signed by NASA and at least one state government and one industry member
- Joint Sponsored Research Agreement signed with Virginia Space Grant Consortium partners to develop a SATSLab comprised of aircraft, airports, and airspace for validation of SATS vehicle and infrastructure features and capabilities.

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- Complete the development rig test of the hot section foil bearing for a representative general aviation engine.
- Simulate and flight test validated AGATE system concepts
- Publish design guidelines; system standards; certification bases and methods
- Completed systems analysis of the benefits of STOL & ESTOL vehicles to the small aircraft transportation system.

Target 1R8: Develop at least three new design tools and accomplish at least four demonstrations of advances in computation and communications.

Aero-Space Focused — High Performance Computing and Communications

- Develop software tools to reduce parallelization time from months to one week while maintaining 50% application performance compared with manual parallelization.
- Develop tools to benchmark testbed performance in computing capability, database manipulation, and scheduling to evaluate alternate scheduling strategies and chose optimal approaches to reduce variability and improve predictability of turnaround time
- Develop automated quality of service data collection tool capable of measuring 2 service classes and scalable to at least 5 nodes
- 3 relevant application codes parallelized; 3 data analysis codes parallelized; documented evaluation of parallelization tools.
- 3X performance in an aerospace application through the integration of networking enhancements into application codes.
- 3 applications interoperating on multiple QoS enabled networks; 50Mbps (aggregate internal) multicast; gigabit performance between 2 NASA sites; 2 applications utilizing enhanced hybrid networking.
- Improvement in aerospace applications: Complete combustor and compressor simulation in 3 hours each; high-fidelity space transportation vehicle analysis in 1 week and optimization enabled; S&C database generation for aerospace vehicles within 1 week; demonstration of improvements in 4 NASA-sponsored design events.
- Assess initial HPCC technology capabilities and customer impacts.

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- Develop software tools for design of advanced computing systems
- Acquire and incorporate new large-scale computing systems and demonstrate seamless operations with heterogeneous distributed computing environment.
- Demonstrate remote connectivity to high data-rate instruments and distributed real-time access to instrument data.
- Demonstrate an environment for aerospace hardware design that includes: remote connectivity and access to flight simulation data, computational simulation data and archival databases.
- Demonstrate prototype cross-fidelity aerospace design system.
- Establish experimental and analytical methodology for composite stringer pull-off failure prediction.
- Figures of merit from static wind tunnel or CFD results developed and assessed for use in predictions of uncommanded transonic lateral motions due to Abrupt Wing Stall
- Conduct turbulence modeling workshop to provide direction for turbulence modeling research to increase design confidence in flight regimes dominated by flow separation
- Conduct assessment of OAT program element impacts on goals of three pillars

Target 1R9: Demonstrate two new concepts in flight and identify three new concepts for further examination.

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- Demonstrate solar-powered remotely-piloted aircraft suitable for science missions to an altitude of 100,000 feet.
- Complete development of a pulse detonated engine inlet
- Complete final validation and testing of an integrated blended-wing-body (BWB) low-speed flight research vehicle in preparation for flight in 2002.
- Complete inlet test for Pulse Detonation Engine application
- Complete second flight of Hyper-X (X-43) at Mach 7
- Complete flight testing of Hyper-X (X-43) at Mach 10.
- Complete an integrated blended-wing-body (BWB) low-speed flight research vehicle prepared and delivered for final validation and testing.
- Identify advanced vehicle concepts for further research
- Demonstrate robust taxi capability with contingency planning for an autonomous vehicle
- Complete 60% of planned experiments on the F-15B testbed aircraft

Target 1R10: Complete assembly of the third X-34 test vehicle, demonstrate 75% of supporting technology developments (programmatic performance indicators are listed below), and complete competitive solicitations for expanded 2nd generation reusable launch vehicle efforts.

Aero-Space Focused — X-33

- A performance indicator for the X-33 is not possible until the liquid hydrogen tank delamination investigation and program impact assessment are complete.

Aero-Space Focused — X-34

- Complete the third X-34 (A-3) vehicle assembly.

Aero-Space Focused — Future-X

- The integrated vehicle health monitoring system flight experiment is delivered for installation in the X-34

Aero-Space Focused — 2nd Generation RLV Focused

- Award multiple industry contracts for Systems Engineering and Requirements Definition, RLV Competition and Risk Reduction and NASA Unique Systems program elements

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- Complete assessment and preliminary design of Pulse Detonation Engine-based hybrid cycle and combined-cycle propulsion systems.
- Complete Phase 1 modifications of the Numerical Propulsion Simulation System to allow analysis of a rocket and a rocket-based-combined-cycle propulsion systems
- Identify protocols and test methods needed for accelerated testing of space transportation vehicle materials
- Extrude near-net thin walled sections of Russian alloy 1441 for aerospace applications
- Complete RLV focused composite cryogenic tank and structures technologies
- Combined Cycle Engine System Selected for first Flight Demonstrator
- Combined Cycle Flowpath Definition and Testing Completed for First Flight Demonstrator

Target 1R11: Commence X-37 vehicle assembly, and complete one Pathfinder flight experiment.

Aero-Space Focused — Future-X

- Commence X-37 vehicle assembly
- ProSEDS evaluation completed
- Flight of Hall Effect Thruster experiment

Target 1R12: Continue the solicitation of customer feedback on the services, facilities and expertise provided by the Aero-Space Technology Enterprise

Triennial Customer Survey

- Complete the Triennial Customer Satisfaction survey, and maintain a "highly satisfied" rating from 35 percent of Enterprise customers.

Facility Utilization Survey

- Achieve a facility utilization customer satisfaction rating of 95 percent at "5" or better, and 80 percent "8" or better ,based on exit interviews.

Technology Transfer

- Transfer at least twelve new technologies and processes to industry during the fiscal year.

Target 1R13: Continue the implementation of current education outreach plans, and establish new plans for all new program activities initiated in FY 01.

Education Outreach

- Implementation examples from current education outreach plans.
- Documented plans for all new program activities initiated in FY 2001.